Claims:

1. A method of managing resources of a histological tissue processor, the tissue processor comprising at least one retort selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the step of:

nominating resources according to one of:

group, where a group nomination corresponds to a resource's function;

type, where a type nomination corresponds to one or more attributes of a resource within a group;

station, where a station nomination corresponds to a point of supply of a resource.

2. A method as claimed in claim 1 wherein a group comprises reagents that function as one of the following:

fixative;

dehydrant;

defatter;

clearer;

wax;

cleaning solvent;

cleaning alcohol;

cleaning water.

3. A method as claimed in claim 1 or 2 wherein type attributes comprise one or more of:

reagent group;

reagent name;

nominal reagent concentration;

nominal reagent concentration thresholds

reagent use thresholds;

reagent temperature thresholds

4. A method as claimed in any one of claims 1 to 3 wherein the corresponding point of supply of a resource comprises one or more of the following attributes:

reagent group;

reagent type;

reagent name;

reagent container;

reagent status;

reagent use history;

reagent use threshold;

reagent concentration history;

reagent concentration threshold;

reagent temperature threshold.

5. A method of determining availability of resources of a histological tissue processor, the tissue processor comprising at least one retort selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the steps of:

predetermining steps for at least one tissue processing protocol;

nominating resources required by the predetermined protocol steps in accordance with a selection methodology;

for all nominated resources, setting a nominated resource as unavailable if the resource fails to meet a first predetermined operating criteria when the resource is scheduled for use by the predetermined protocol steps;

determining a user requirement comprising one of a schedule mode and a run time mode;

setting nominated resources that meet the first predetermined operating criteria and fail to meet further predetermined operating criteria corresponding to the determined user requirement as unavailable;

setting all remaining nominated resources as available.

6. A method as claimed in claim 5 wherein the selection methodology comprises a method as claimed in any one of claims 1 to 4.

7. A method as claimed in claim 6 wherein the first predetermined operating criteria comprises:

a station being in a full state such that the station holds sufficient reagent to fill a retort.

8. A method as claimed in claim 6 or 7 wherein the further predetermined operating criteria corresponding to the determined user requirement comprises any one or more of:

in run time mode, a station being in a full state such that the station holds sufficient reagent to fill a retort;

in schedule mode, a station not being used in a preceding protocol step;

in run time mode, a station not being previously used in two sequential protocol steps;

in schedule mode, a station not holding the purest reagent;

in either schedule or run time mode:

a station holding a reagent that has equal or greater purity than the reagent of a station used in the preceding protocol step;

a station with a reagent not exceeding a temperature threshold for a given protocol step;

a station with a reagent not exceeding a threshold of one of purity, number of tissue cassettes treated, protocol cycles or, age.

9. A method of selecting a resource of a histological tissue processor, the tissue processor comprising at least one retort selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the steps of:

determining the availability of one or more of the plurality of resources;

determining the status of a tissue processing protocol step within a tissue processing protocol based on a resource selection methodology;

determining at least one characteristic of the plurality of resources;

selecting an available resource in accordance with a predetermined selection criteria wherein the predetermined selection criteria is based on the determined status of the tissue processing protocol step and the determined resource characteristic.

10. A method as claimed in claim 9 wherein the step of determining the availability of one or more of the plurality of resources comprises a method as claimed in any one of claims 5 to 8.

11. A method as claimed in any one of claims 9 to 10 wherein the status of a tissue processing protocol step comprises the order of occurrence of the protocol step with the protocol.

12. A method as claimed in any one of claims 9 to 11 wherein the step of determining at least one characteristic of the plurality of resources comprises determining the purity of a reagent.

13. A method as claimed in any one of claims 9 to 12 wherein the step of determining at least one characteristic of the plurality of resources comprises determining the number of tissue cassettes processed.

14. A method as claimed in claim 12 wherein the purity of a reagent is determined in accordance with the following steps:

upon running a tissue processing protocol, estimate a carry over volume for each reagent component according to:

$$V_{CO} = (N_b \times C_b) + (N_c \times C_c) + (N_p \times N_c \times C_p) + V_{cr}$$

where

V_{CO} = volume of carry over (ml)

N_b = number of baskets per retort

C_b = carry over per basket (ml)

N_c = number of cassettes

C_c = carry over per cassette (ml)

N_p = number of biopsy pads per cassette

C_p = carry over per biopsy pad (ml)

V_{cr} = carry over for an empty retort (ml),

after each retort fill, estimate the carry over amount in a reagent container for each reagent component according to:

$$V_{pc} = (Pp \times V_{CO}) / 1000$$

where

V_{pc} = volume of a reagent component carried over from a previous reagent container

Pp = proportion of reagent component in previous reagent container,

after each retort fill, estimate the volume of each reagent component according to:

$$V_{af} = V_{pc} + (V_b \times P_{bf})$$

where

V_{af} = volume of reagent component in the reagent container after retort fill

P_{bf} = proportion of reagent component in reagent container before retort fill

V_b = volume available in reagent container

after each retort fill, estimate the proportion of each reagent component in the reagent container according to:

$$P_{af} = V_{af} / V_b$$

where,

P_{af} = proportion of reagent component in the reagent container after retort fill,

after each retort fill nominate a selected reagent component as a primary component and return P_{af} as the purity of the primary component.

15. A method as claimed in any one of claims 9 to 14 further comprising the step of updating reagent properties of a station according to the following:

a) requesting the following information from a user of the tissue processor:

confirmation that the user wishes to change a reagent in a given station;

reagent group;

reagent type;

station purity;

station status;

b) updating reagent properties according to the information provided in step a).

16. A method as claimed in claim 15 further comprising the step of:

initiating a system request at regular intervals to determine whether a station's reagent has been removed;

informing a user when a reagent has been replaced and performing steps a) and b) of claim 15.

17. A method of scheduling tissue processing protocols of a histological tissue processor, the tissue processor comprising at least two retorts selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising resolving conflict between protocol steps allocated respectively to the retorts, comprising the steps of:

determining a priority for each tissue processing protocol;

selectively modifying at least one protocol step of at least one of the tissue processing protocols based on the determined priority.

18. A method as claimed in claim 17 further comprising the steps of:

assigning a first tissue processing protocol with a highest priority;

assigning at least one second tissue processing protocol with a lower priority; and

fixing the protocol steps of the highest priority protocol so as to remain unmodified.

19. A method as claimed in claim 17 wherein, the step of selectively modifying at least one protocol step comprises lengthening the duration of at least one protocol step of a lower priority tissue processing protocol(s).

20. A method as claimed in claim 17 wherein, the step of selectively modifying at least one protocol step comprises lengthening the duration of at least one protocol step of a highest priority tissue processing protocol(s).

21. A method as claimed in claim 17 wherein, the step of selectively modifying at least one protocol step comprises shortening the duration of at least one protocol step of a lower priority tissue processing protocol(s).

22. A method as claimed in claim 17 wherein, the step of selectively modifying at least one protocol step comprises shortening the duration of at least one protocol step of a highest priority tissue processing protocol(s).

23. A method as claimed in any one of claims 17 to 22 wherein, at least one protocol step, other than the protocol step selectively modified, is correspondingly modified such that the total duration of each tissue processing protocol remains unmodified.

24. A method as claimed in any one of claims 17 to 23 wherein, the at least one protocol step is selectively modified within predetermined limits.

25. A method as claimed in any one of claims 9 to 16 wherein the tissue processor comprises at least two retorts and the method further comprises scheduling two or more tissue processing protocols comprising the steps of:

determining single protocol schedules for each individual tissue processing protocol comprising the steps of;

allocating a user defined reference time point;

determining a sequence of protocol steps in accordance with a logical progression of actions based on one or more of: a start time, an end time and a duration of each protocol step;

allocating resources for use in accordance with at least one protocol step;

determining a multiple protocol schedule comprising the steps of:

combining two or more single protocol schedules wherein the two or more single protocol schedules overlap in time;

resolving conflict between protocol steps of the two or more single protocol schedules.

26. A method as claimed in claim 25 wherein the step of resolving conflict between protocol steps is performed in accordance with a method as claimed in any one of claims 17 to 24.

27. A method as claimed in claim 25 or 26 wherein, the user defined reference time point is one of:

a protocol start time;

a protocol end time;

a protocol step start time; and

a protocol step end time.

28. A method as claimed in claim 25, 26 or 27 wherein, each of the protocol steps comprises performing any one of the following:

fixation;

dehydration;

defatting;

clearing;

infiltration;

cleaning;

drying;

concluding protocol.

29. A method as claimed in any one of claims 25 to 28 further comprising the step of displaying a determined protocol schedule to a user for confirmation.

30. A method of managing thermal resources of a histological tissue processor, the tissue processor comprising at least one retort in operative connection with thermal resources for accelerating tissue processing steps and the at least one retort further selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the steps of:

a) evaluating existing system heating power states of the thermal resources comprising the steps of:

retrieving existing heating power states of the thermal resources;

determining whether one or more thermal resources has signalled a heating power request;

selecting a corresponding heating power setting for each signalled heating power request;

b) delegating system heating power comprising the steps of:

determining updated thermal resource heating power states in accordance with a first predetermined criteria;

allocating heating power to the thermal resources in accordance with a second predetermined criteria wherein the second predetermined criteria is based on the updated thermal resource heating power states.

31. A method as claimed in claim 30 wherein a signalled heating power request comprises one of:

a ramping power request and;

a maintaining power request.

32. A method as claimed in claim 31 wherein a heating power setting for a ramping power request is selected from a heating power table and a heating power setting for a maintaining power request is selected from a steady state power table.

33. A method as claimed in claim 31 or 32 wherein the tissue processor comprises at least two retorts and the first predetermined criteria comprises:

both first and second retorts' thermal resources ramping;

first retort's thermal resources ramping, second retort's thermal resources on;

first retort's thermal resources on, second retort's thermal resources ramping;

both first and second retorts' thermal resources on;

first retort's thermal resources ramping, second retort's thermal resources off;

first retort's thermal resources off, second retort's thermal resources ramping;

both first and second retorts' thermal resources off.

34. A method as claimed in any one of claims 30 to 33 wherein the second predetermined criteria comprises:

a proportional share of heating power such that the proportional share of heating power is normalised for each thermal resource.

35, A method as claimed in any one of claims 30 to 34 wherein the first and second retort's thermal resources comprise heaters for one or more of the following:

a retort;

a retort valve;

a wax bath;

a wax fluid line;

a wax valve.

36. A method of controlling heaters of a selected component of a histological tissue processor for decreasing heat up times of the component and accelerating tissue processing steps, the tissue processor comprising at least one retort selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the steps of:

ascertaining at least one of a plurality of temperature readings from each tissue processor component;

determining the fill state of the selected component;

selecting a predetermined heater control algorithm based on at least one or more of:

the number of ascertained temperature readings;

the location at which the temperature of the temperature readings is measured;

the determined fill state of the selected component.

37. A method as claimed in claim 36 wherein the selected component is one of a retort and a wax bath.

38. A method as claimed in claim 36 or 37 wherein the predetermined heater control algorithm is one of:

a liquid control algorithm;

a liquid sensor control algorithm;

a heater mat control algorithm;

a heater mat sensor control algorithm.

39. A method as claimed in claim 38 wherein the heater mat control algorithm and the heater mat sensor control algorithm are one and the same algorithm.

40. A method as claimed in any one of claims 36 to 39 wherein a temperature sensing module is operatively associated with a retort and comprises at least two individual temperature sensing elements.

41. A method as claimed in claim 40 wherein the temperature sensing module comprises temperature sensing elements located at one or more of:

a wall of a retort, and:

at least one heating device operatively connected to a retort for heating the retort and its contents.

42. A method as claimed in claim 36 or 37 wherein the selected predetermined heater control algorithm comprises the steps of turning retort heaters off if no temperature readings are returned.

43. A method of accelerating the processing of histological tissue samples comprising the steps of:

sensing the temperature of a selected component of a tissue processor with a first temperature sensor operatively connected to the selected component;

heating the selected component with at least one heating device operatively connected to the selected component;

wherein the at least one heating device is maintained at a temperature at or above a desired operating temperature of the selected component until the first temperature sensor senses the desired operating temperature.

44. A method as claimed in claim 43 further comprising the step of:

sensing the temperature of the at least one heating device with a second temperature sensor operatively connected to the at least one heating device so as to allow the at least one heating device to be operated at its maximum operating temperature in order to minimise the time required for the at least one heating device to heat the selected component to the desired operating temperature.

45. A method as claimed in claim 43 or 44 wherein the selected component of the tissue processor is any one or more of:

one or more tissue processing retorts;

one or more tissue processing retort valves;

one or more tissue processing wax storage baths;

one or more tissue processing fluid lines connecting one or more retorts and wax storage baths.

46. A method of managing reagent resources of a histological tissue processor, the tissue processor comprising at least one retort selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the steps of:

determining a purity of a reagent associated with at least one of the reagent resources comprising an estimation of a carry over volume of the reagent during a predetermined time interval of a tissue processing protocol;

assigning the reagent for use in a predetermined tissue processing protocol step in accordance with the determined purity of the reagent.

47. A method as claimed in claim 46 wherein the carry over volume of the reagent is estimated from one or more of:

a) a number of tissue cassettes used in the predetermined time interval based on a carry over volume per cassette and;

b) a number of biopsy pads used in the predetermined time interval based on a carry over volume per biopsy pad.

48. A method of scheduling tissue processing protocols of a histological tissue processor, the tissue processor comprising at least two retorts selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, the method comprising the steps of:

allocating a tissue processing protocol to each respective retort;

assigning a priority for each allocated tissue processing protocol;

selectively modifying at least one protocol step of the tissue processing protocol assigned with a lower priority.

49. A method as claimed in claim 48 wherein the step of selectively modifying at least one protocol step comprises modifying the duration of the first protocol step of the tissue processing protocol.

50. A method as claimed in claim 49 wherein the first protocol step selectively modified comprises a tissue fixing protocol step.

51. A histological tissue processing apparatus operating in accordance with the method steps of any one of claims 1 to 50.

52. A histological tissue processing apparatus as claimed in claim 51 comprising two retorts selectively connected for fluid communication to at least one of a plurality of reagent resources by a valve mechanism, said apparatus further comprising:

processor means adapted to operate in accordance with a predetermined instruction set,

said apparatus, in conjunction with said instruction set, being adapted to perform the method steps as claimed in any one of claims 1 to 50.

53. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, managing the resources of a histological tissue processor, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 1 to 4 or 46 to 47.

54. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, determining availability of resources in a histological tissue processor, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 5 to 8.

55. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, selecting a resource in a histological tissue processor, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 9 to 16 or 25 to 29.

56. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, managing thermal resources of a histological tissue processor, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 30 to 35.

57. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, controlling heaters of a selected component of a histological tissue processor, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 36 to 42.

58. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, accelerating the processing of histological tissue samples, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 43 to 45.

59. A computer program product comprising:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for, scheduling tissue processing protocols of a histological tissue processor, within a data processing system, said computer program product comprising:

computer readable code within said computer usable medium for:

performing the method steps of any one of claims 17 to 24 or 48 to 50.

60. A method, system or protocol substantially as herein described with reference to at least one of the accompanying drawings.

61. An apparatus substantially as herein described with reference to at least one of the accompanying drawings.